



LP8000 Installation and Reference Manual

Table of Contents

Installation

[Compatibility](#)

[Prerequisites](#)

[Set Jumpers](#)

[Install HBA](#)

[Change GBIC](#)

[Attach Media](#)

[Apply Power](#)

[View LEDs](#)

Reference

[Specifications](#)

[DB9 Pinout](#)

[FCC and Regulatory Notices](#)

[Declaration of](#)

[Conformity](#)

[Laser Safety](#)

Chapter 1 – Installation

Table of Contents

<u>.....</u>	<u>Compatability</u>
<u>.....</u>	<u>Prerequisites</u>
<u>.....</u>	<u>Set Jumpers</u>
<u>.....</u>	<u>Install HBA</u>
<u>.....</u>	<u>Change GBIC</u>
<u>.....</u>	<u>Attach Media</u>
<u>.....</u>	<u>Apply Power</u>
<u>.....</u>	<u>View LEDs</u>

Installation

Caution Emulex LightPulse Host Bus Adapters (HBAs) contain electronic components that can be damaged by static electricity through an electrostatic discharge (ESD) event. To prevent ESD damage, maintain frequent contact with any grounded metal surface. A grounding wrist strap is useful for this purpose. Handle the card carefully at all times and preferably by the edges. Avoid touching electronic components and keep the card in the original packaging until you are ready for installation.

Compatibility

Software Environments	Windows Server 2003, Windows 2000, Windows NT, NetWare, HP-UX, Linux, Solaris, AIX
Hardware Environments	PCI hardware platforms: x86, SPARC and PowerPC

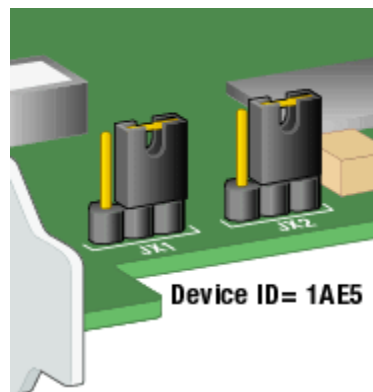
Prerequisites

- One open 32-bit or 64-bit (recommended) PCI bus slot with a 3.3 VDC or 5.0 VDC signaling interface
- Maximum PCI bus clock rate of 33 MHz
- Media and connectors (user supplied)
 - ◆ Multimode fiber optic cable (50/125 μ m or 62.5/125 μ m) with dual SC connectors, used with short wave lasers
 - ◆ Single mode fiber optic cable (9/125 μ m) with dual SC connectors, used with long wave lasers
 - ◆ Copper duplex cabling with DB9 connectors (also called DE9)

Set Jumpers

The host adapter has two jumper blocks (JX1, JX2) that control the host adapter's device ID. The default Device ID is F800.

Device ID	Jumper Setting
F800	JX1:1-2, JX2:2-3
F801	JX1:2-3, JX2:1-2
1AE5	JX1:2-3, JX2:2-3



Install Host Bus Adapter Board

1. Record IEEE address and serial number.

Each host adapter is shipped with a unique address identifier called the IEEE address. The Fibre Channel industry uses a World Wide Name (WWN) derived from the IEEE address, and this number is need for arbitrated loop connectivity. The serial number is used when communicating with Emulex. Both numbers are clearly marked on the board. We recommend that you record these numbers before installation.

2. Turn off and unplug the computer.
3. Remove the computer case.
4. Remove the blank panel from an empty 32– or 64–bit PCI bus slot.
5. Insert host adapter board into the empty 32– or 64–bit PCI bus slot.
Press firmly until the board is seated.
6. Secure the host adapter's mounting bracket to the case with the panel screw.
7. Replace the computer case and tighten case screws.

The host adapter is now installed in the PC and is ready for media attachment.

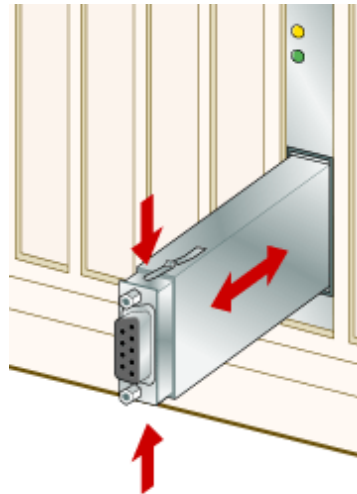
Change the GBIC Connector

A GBIC, or Gigabit Interface Converter, is a connector that offers a flexible choice of copper or fiber optic media. A GBIC supports either short wave or long wave optical transmission. These types are available:

- Short-wave fiber optic GBIC with dual SC connectors
- Long-wave fiber optic GBIC with dual SC connectors
- Copper GBIC with DB9 connector

Caution An Emulex supplied GBIC is required to maintain regulatory compliance with worldwide certifications (for example, FCC, C-Tick, CE, and so on).

A GBIC should be matched with its cabling to obtain optimum performance and distance. For example, a short wave fiber optic GBIC best supports either 62.5/125 or 50/125 multimode cable, while a long wave fiber optic GBIC functions best with 9/125 single mode cable.



To change a GBIC:

1. Exert slight pressure on the tabs.
2. Gently pull out the GBIC as shown.
3. Slide in a new GBIC, pressing firmly to seat the GBIC into the board.

Attach Media

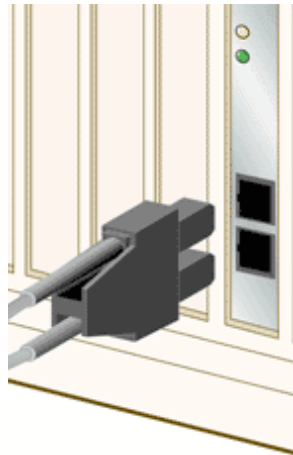
Attach fibre optic or copper cable to the host bus adapter.

Attach Fiber Optic Cable (Multi/Single Mode)

Note The host adapter will not allow normal data transmission on an optical link unless it is connected to another similar or compatible laser product (that is, multimode to multimode.)

Use fiber optic cable supporting a data rate of 1.0625 Gb/s for short-wave and long-wave lasers, that adheres to the following specifications:

Fiber Optic Cable	Maximum Length	Minimum Length	Connector
62.5/125 μ m (multimode)	175 meters	2 meters	Dual SC
50/125 μ m (multimode)	500 meters	2 meters	Dual SC
9/125 μ m (single mode)	10,000 meters	2 meters	Dual SC



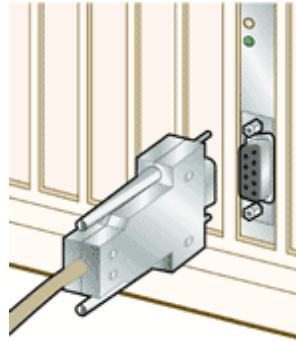
1. Connect the fiber optic cable to the dual SC connector on the host adapter board as shown.
2. Connect the other end of the cable to the Fibre Channel device.

After the media is connected to the host adapter, you are ready to apply power to the computer.

Attach Copper Duuplex Cable

Use copper Twinax or Quad Axial cable that adheres to the following specifications:

Cable Type	Maximum Length	Data Rate	Connector
Twinax or Quad Axial	30 meters	1.0625 Gb/s	DB9



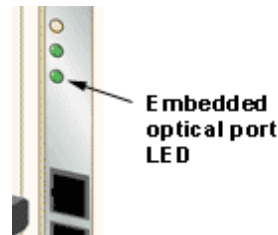
1. Connect the copper duplex cable to the DB9 connector on the host adapter board as shown.
2. Connect the other end of the cable to the Fibre Channel device.

After the media is connected to the host adapter, you are ready to apply power to the computer.

Apply Power

1. Verify that the host adapter is securely installed in the computer.
2. Verify that correct media is attached.
3. Plug in and turn on the computer.
4. Observe LEDs for Power On Self Test (POST) results.

View LEDs



Green and yellow display lights (LEDs) can be seen through openings in the host adapter's mounting bracket. Green indicates power and yellow signifies port activity. A third LED is present on LP8000 models with embedded optical interfaces, and indicates that light is being received by the port.

POST conditions and results are summarized in this table.

Green LED	Yellow LED	State
OFF	OFF	Wake-up failure (dead board)
OFF	ON	POST failure (dead board)
OFF	Slow blink (1 Hz)	Wake-up failure (dead board)
OFF	Fast blink (4 Hz)	Failure in POST (dead board)
OFF	Flashing (irregular)	POST processing in progress
ON	OFF	Failure while functioning
ON	ON	Failure while functioning
ON	Slow blink (1 Hz)	Normal – link up
ON	Fast blink (4 Hz)	Normal – Updating firmware or driver initializing
Blink	OFF	Normal – link down or not yet started

Chapter 2 – Reference

Table of Contents

.....	Specifications
.....	DB9 Pinout
.....	FCC and Regulatory Notices
.....	Declaration of Conformity
.....	Laser Safety

Hardware Reference

Specifications

Parameter	Range
Hardware Interface	20 pin connector for GBIC models
Physical Dimensions	Short PCI form factor 6.88" x 4.20"
Power Requirements	11 watts @ + 5.0 VDC (typical)
Airflow	100 lfm minimum
Temperature	Operating:K2° to 113° F (0° to 45° C) Storage:14° to 131° F (–10° to 55° C)
Humidity	5% to 95% non–condensing
Agency Approvals for LP8000–D1	UL recognized to UL1950 CUR recognized to CSA22.2, No. 950 TUV certified to EN60950 FCC Rules, Part 15, Class A Industry Canada, ICES–003, Class A EMC Directive 89/336/EEC (CE Mark) EN55022, Class A EN50082–1 Australian EMC Framework (C–Tick Mark) AS/NZS 3548: Class A VCCI, Class A.
Agency Approvals for LP8000–N1/T1/L1 and LP8000–F1	Class 1 Laser Product per DHHS 21CFR (J) & EN60825 UL recognized to UL1950 CUR recognized to CSA22.2, No.950 TUV certified to EN60950 FCC Rules, Part 15, Class B Industry Canada, ICES–003, Class B EMC Directive 89/336/EEC (CE Mark) EN55022, Class B EN50082–1 Australian EMC Framework (C–Tick Mark) AS/NZS 3548: Class B VCCI, Class B

Hardware Reference

Copper Port (DB9) Pinout

This pinout applies to embedded copper ports.

Pin	Signal	Direction
1	TX+	Output
2	VCC	VCC
3	Fault -	Input
4	Key	NC
5	RX+	Input
6	TX-	Output
7	ODIS +	Output
8	GND	GND
9	RX-	Input

Hardware Reference

FCC and Regulatory Notices

CLASS 1 LASER PRODUCT
LASER KLASSE 1
LUOKAN 1 LASERLAITE
APPAREIL A` LASER DE CLASSE 1
TO IEC 825-1 (1993) + CENELEC HD 482 S1

The above statement applies to products marketed in the European Union.

Model LP8000–D1 (Embedded Copper)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Shielded cables must be used between this equipment and attached peripheral devices. The reader is cautioned that changes or modifications made to the equipment not expressly approved by Emulex could void the user's authority to operate this equipment.

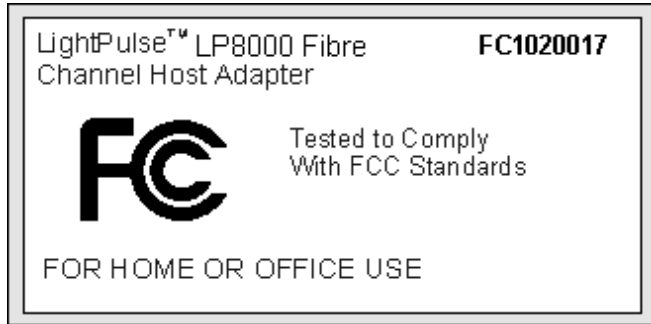
The above statement applies to products marketed in the USA

This class A digital apparatus meets all requirements of the Canadian Interference – Causing Equipment Regulations.

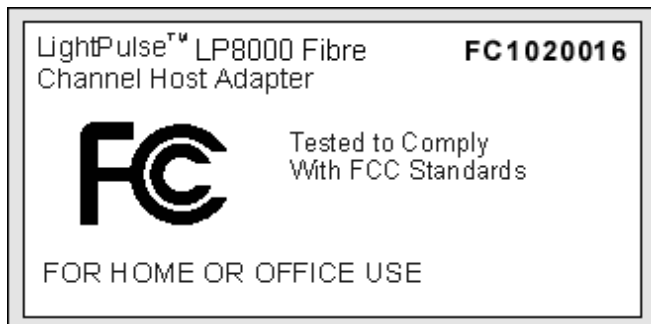
Cet appareil numerique de la Classe A respecte toutes les exigences du reglement sur le materiel brouilleur du Canada.

This statement applies to products marketed in Canada.

FCC Compliance Information Statement; Models LP8000–N1/L1/T1 (GBIC Models):



FCC Compliance Information Statement; Model LP8000–F1 (1 X 9):



This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Responsible Party: Paul Folino, President & CEO, Emulex Corporation, 3535 Harbor Blvd., Costa Mesa, CA 92626, USA, (714) 662–5600

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

The reader is cautioned that any changes or modifications to the equipment not expressly approved by Emulex could void the user's authority to operate this equipment.

This class B digital apparatus meets all requirements of the Canadian Interference – Causing Equipment Regulations. Cet Appareil numerique de la classe B respecte toutes les exigences du reglement sur le material brouilleur du Canada.

The above statement applies to products marketed in Canada.

VCCI Notices and Translations (Japan Only)

Note VCCI regulations provide that changes or modifications not expressly approved by Emulex Corporation could void your authority to operate this equipment.

LP8000–N1/ L1/T1/F1 (GBIC and 1x9 Models):

この装置は、情報処理装置等電波障害自主規制協議会 (VCCI) の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Translation:

This is a Class B product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

LP8000–D1 (Embedded Copper Model):

この装置は、クラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Translation:

This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures. VCCI—A

Manual Notice

この装置は、情報処理装置等電波障害自主規制協議会 [VCCI] の基準に基づくクラスA 情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

Translation:

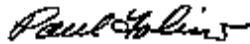
This is a Class A product based on the standard of the Voluntary Control Council for Interference by Information Technology Equipment (VCCI). If this equipment is used in a domestic environment, radio disturbance may arise. When such trouble occurs, the user may be required to take corrective actions.

Hardware Reference

Declaration of Conformity

Note Changes or modifications not expressly approved by Emulex Corporation could void the user's authority to operate this equipment.

DECLARATION OF CONFORMITY	
<p>Manufacturer: Emulex Corporation 3535 Harbor Blvd. Costa Mesa, CA 92626 USA</p>	
<p>declares under sole responsibility that the product:</p>	
Product Name:	LightPulse™ LP8000 Fibre Channel PCI Host Adapter
Assembly Number:	FC1020017-XX (GBIC model) FC1020016-XX (embedded optical, 1x9 model)
Accessories:	Emulex PN 2300029 (Active Copper DB9 GBIC Module) Emulex PN 2300028 (Shortwave Optical GBIC Module) Emulex PN 2300030 (Longwave Optical GBIC Module)
<p>to which this declaration relates is in conformity with the following standards or other documents:</p>	
Safety:	IEC950:1991+A1,A2/EN60950 (1992)+ A1,A2 including EN60825-1 (1994) TUV Rheinland, Certificate No. R9677151.1
EMC:	EN55022 (1994)/CISPR-22 (1993), Class A EN50082-1 (1997)
<p>following the provisions of the Low Voltage Directive 73/23/EEC and EMC Directive 89/336/EEC (as amended by 92/31/EEC) and is Marked in accordance with the CE Marking Directive 93/68/EEC</p>	
<p>February 18, 1999 Costa Mesa, CA</p>	
European Contact:	Emulex Corporation 7 & 8 Forrest Court Oaklands Park Fishponds Road Wokingham, Berkshire RG41 2FD, England
Telephone:	44-118-977-2929 Fax: 44-118-977-3237

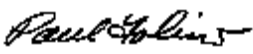


Paul Folino, President & CEO

This equipment complies with CISPR22/EN55022 Class A.

Warning This is a class A product. In a domestic environment, this product may cause radio interference requiring the user to take adequate measures.

This Declaration identifies the product, manufacturer's name and address, and applicable specifications recognized in the European Union.

DECLARATION OF CONFORMITY	
Manufacturer: Emulex Corporation 3535 Harbor Blvd. Costa Mesa, CA 92626 USA	
declares under sole responsibility that the product:	
Product Name:	LightPulse™ LP8000 Fibre Channel PCI Host Adapter
Assembly Number:	FC1020019-XX (Embedded DB9 model)
to which this declaration relates is in conformity with the following standards or other documents:	
Safety:	IEC950:1991+A1,A2/EN60950 (1992)+ A1,A2 TUV Rheinland, Certificate No. R9677151.1
EMC:	EN55022 (1994)/CISPR-22 (1993), Class A EN50082-1 (1997)
following the provisions of the Low Voltage Directive 73/23/EEC and EMC Directive 89/336/EEC (as amended by 92/31/EEC) and is Marked in accordance with the CE Marking Directive 93/68/EEC	
 Paul Folino, President & CEO	
November 25, 1998 Costa Mesa, CA	
European Contact:	Emulex Corporation 7 & 8 Forrest Court Oaklands Park Fishponds Road Wokingham, Berkshire RG41 2FD, England
Telephone:	44-118-977-2929 Fax: 44-118-977-3237

FC1055001-07B
February 2000

Laser Safety Notice

This laser safety information contains certification and product information covering laser products known as optical Gigabaud Link Modules (GLMs), Gigabit Interface Converters (GBICs), 1x9 and small form factor transceivers sold as accessories to or incorporated in Emulex LightPulse host adapters. The GLM, GBIC, 1x9 and small form factor transceiver are the primary cable connection mechanisms for any optical port on the host adapter and hub. This data is not intended to be a replacement for any safety regulations and standards; relevant safety documents should always be consulted if necessary. Contact Emulex Corporation with any questions or concerns about laser safety.

[Certification and Classification](#)

[Labeling Requirements](#)

[Product Information](#)

[Usage Restrictions](#)

[System Level Certification](#)

Certification and Classification

LP6000 and LP7000E PCI host adapters may contain a laser product known as an optical Gigabaud Link Module (GLM). The optical GLM is attached to the host adapter using an 80-pin connector and extends through the mounting bracket. In turn, the host adapter can be inserted into any host system's PCI slot.

The LH5000 hub may contain a laser product known as a Gigabit Interface Connector (GBIC). The GBIC provides the physical connector to the optical cable. The GBIC can be inserted into any pluggable hub port.

The LP8000, LP850 and LP9000 PCI host adapter may contain a laser product known as a Gigabit Interface Converter (GBIC) or an embedded 1x9 transceiver. The GBIC and or 1x9 transceiver provide the physical connection to the optical cable, and its SC-style connector extends through the mounting bracket. In turn, the host adapter can be inserted into any host system's PCI slot.

The LP9002, LP9002L, LP952L, LP9002S, LP9002DC, LP9002C, and LP9402DC PCI host adapters may contain a laser product known as a small form factor transceiver. This transceiver provides the physical connection to the optical cable, and its LC-style connector extends through the mounting bracket. In turn, the host adapter can be inserted into any host system's PCI/cPCI slot.

In the United States, all optical GLMs, GBICs, 1x9 and small form factor transceivers sold by Emulex are certified as Class 1 laser products that conform to the requirements contained in the Department of Health and Human Services (DHHS) regulation 21 CFR subchapter J. The certification is indicated by a label located on the optical GLM, GBIC, 1x9 or small form factor transceiver.

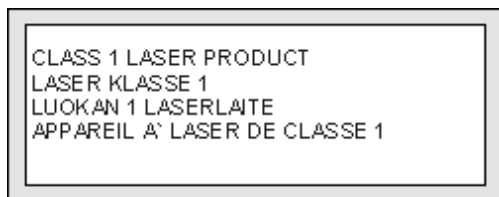
In Europe, all optical GLMs, GBICs, 1x9 and small form factor transceivers sold by Emulex are certified as Class 1 laser component assemblies that conform to the requirements contained in the CENELEC (European Committee for Electrotechnical Standardization) standard EN60825–1:1994 (including amendment 11) and EN60825–2:1994. GLMs, GBICs, 1x9 and small form factor transceivers are certified by a recognized European testing agency and have appropriate markings on the assembly. The DHHS conformity label and European conformity mark will not be visible externally once the optical GLM, GBIC, 1x9 or small form factor transceiver is connected to or inserted in the host adapter and the adapter is installed into a system.

Labeling Requirements

No caution or danger labels are required for use of the GLM, GBIC, 1x9 or small form factor transceiver since they are Class 1 laser component assembly. In the U.S., the only laser safety label required is the DHHS certification label that already appears on the GLM, GBIC, 1x9 and small form factor transceiver. In Europe, the EN60825–1/EN60825–2 standards require that the system–level product has a Class 1 information label permanently attached and clearly visible whenever access to the GLM, GBIC, 1x9 and small form factor transceiver optical port is possible. Each Class 1 product shall have affixed an explanatory label bearing the words:



Alternatively, at the discretion of the manufacturer, the same statement may be included in user information. If a label is used, an example of the IEC Class 1 information label that is suitable for most European countries is shown below. The label consists of black printing on a white background. Languages represented on this label are English, German, Finnish and French, and they represent the minimum set for acceptance of a Class 1 product in most European countries.



Product Information

[GLM](#)

[GBIC](#)

[1 x 9 Transceiver](#)

[Small Form Factor Transceiver](#)

GLM

The optical GLM is a single port communications card. Each communication port consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains a semiconductor laser diode of gallium aluminum arsenide (GaAlAs). This material emits in the wavelength range of 770 to 860 nanometers for shortwave and 1270 to 1355 nanometers for long wave, and are commonly referred to as short wavelength (SW) or long wavelength (LW) lasers. The discrete laser diodes are classified as Class 3B laser products. Once they are incorporated into the GLM, the product's automatic power control maintains the average power launched into a fiber at a value below the Class 1 limit.

Note OFC GLMs are found only on the LP6000. Any reference to OFC or non-OFC products applies only to the LP6000, and not to the LP7000E, LP8000, LP850 or LP9000.

For OFC GLMs (Open Fiber Control) the optical fiber link between two GLM ports is continuously monitored by the open fiber link detection and laser safety control system (OFC). In the event of a break anywhere in the path, this control system prevents laser emissions from exceeding Class 1 levels. For non-OFC links, the optical power from the laser transmitter is controlled and maintained at a lower power level. The power emitted from either an open fiber or open laser transmitter is guaranteed to be below the Class 1 limit. Class 1 laser products are not considered hazardous. No user maintenance, service operations or adjustments can be performed on any GLM accessory.

GBIC

The optical GBIC is an integrated duplex data link for bi-directional communications over multimode or single mode optical fiber. Each GBIC consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains a semiconductor laser emitting in the wavelength range of 770 to 860 nanometers for shortwave length GBICs and 1270 to 1355 nanometers for long wavelength GBICs. For non-OFC links, the optical power from the laser transmitter is controlled and maintained at a lower power level. The power emitted from either an open fiber or open laser transmitter is guaranteed to be below the Class 1 limit. Class 1 laser products are not considered hazardous. No user

maintenance, service operations or adjustments can be performed the GBIC.

Small Form Factor Transceiver

The small form factor transceiver is an integrated duplex data link for bi-directional communications over multimode or single mode optical fiber. Each small form factor transceiver consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains a semiconductor laser emitting in the wavelength range of 770 to 860 nanometers for shortwave length small form factor transceivers and 1270 to 1355 nanometers for long wavelength small form factor transceivers. For non-OFC links, the optical power from the laser transmitter is controlled and maintained at a lower power level. The power emitted from either an open fiber or open laser transmitter is guaranteed to be below the Class 1 limit. Class 1 laser products are not considered hazardous. No user maintenance, service operations or adjustments can be performed the small form factor transceiver.

1x9 Transceiver

The 1x9 transceivers is an integrated duplex data link for bi-directional communications over multimode fiber. Each 1x9 consists of a transmitter and receiver optical subassembly. The transmitter subassembly contains a semiconductor laser emitting in the wavelength range of 770 to 860 nanometers for shortwave 1x9s. For non-OFC links, the optical power from the laser transmitter is controlled and maintained at a lower power level. The power emitted from either an open fiber or open laser transmitter is guaranteed to be below the Class 1 limit. Class 1 laser products are not considered hazardous. No user maintenance, service operations or adjustments can be performed the 1x9 transceiver.

Usage Restrictions

Failure to comply with these usage restrictions may result in incorrect operation of the system and could possible lead to points of access that may emit laser radiation levels above the Class 1 limits established in the U. S. by the DHHS and within Europe by EN60825-1/EN60825-2.

[GLM](#)

[GBIC](#)

[1 x 9 Transceiver](#)

[Small Form Factor Transceiver](#)

GLM

The GLM is designed and certified for applications using point-to-point optical fiber links only. Use of the product with multiple input or multiple output optical links (for example, star couplers) is prohibited since it is incompatible with the GLM's certification.

The GLM will not allow normal data transmission on the optical link unless it is connected to another similar GLM or compatible laser product. For OFC GLMs, another manufacturer's laser product is not considered compatible unless it contains the open fiber link detection and laser safety control system (OFC) and is properly certified as a Class 1 laser product. Similarly, for non-OFC GLMs, a compatible laser device must be non-OFC.

Any system level product that incorporates the GLM must provide power supply protection that guarantees a voltage of 6.0 volts or less at the GLM. The functional power supply range of the GLM product is specified as 4.75 to 5.25 volts typically. Operation outside of this range may degrade the performance and lifetime of the GLM. The GLM will remain operational with laser emissions below Class 1 limits provided the power supply level at the adapter remains at or below 6.0 volts. If the power supply level rises above 6.0 volts, the GLM cannot be guaranteed to operate correctly and could result in laser emissions that may exceed Class 1 limits.

GBIC

Short wavelength and long wavelength GBICs allow normal data transmission on the optical link when they are connected to another compatible laser product. Short wavelength and long wavelength GBICs sold by Emulex as accessories are non-OFC devices. For non-OFC links, a compatible laser device must be non-OFC and certified as a Class 1 laser product.

1 x 9 Transceiver

Short wavelength 1x9 transceivers allow normal data transmission on the optical link when they are connected to another compatible laser product. Short wavelength 1x9s embedded in Emulex host adapters are non-OFC. For non-OFC links, a compatible laser device must be non-OFC and certified as a Class 1 laser product.

Small Form Factor Transceiver

Short wavelength and long wavelength small form factor transceivers allow normal data transmission on the optical link when they are connected to another compatible laser product. Short wavelength and long wavelength small form factor transceivers embedded in Emulex host adapter are non-OFC. For non-OFC links, a compatible laser device must be non-OFC and certified as a

Class 1 laser product.

Any system level product that incorporates the small form factor transceivers must provide power supply protection that guarantees a voltage of 5.0 volts or less at the small form factor transceivers. The functional power supply range of the small form factor transceivers product is specified as 3.135 to 3.465V typically. Operation outside of this range may degrade the performance and lifetime of the transceiver. The transceiver will remain operational with laser emissions below Class 1 limits provided the power supply level at the adapter remains at or below 5.0 volts. If the power supply level rises above 5.0 volts, the small form factor transceiver cannot be guaranteed to operate correctly and could result in laser emissions that may exceed Class 1 limits.

System Level Certification

All GLMs and GBICs sold as accessories by Emulex or host adapters containing embedded 1x9 or small form factor transceivers are certified as Class 1 laser products within the U.S. and Class 1 laser component assemblies outside of the U.S. Manufacturers of products properly incorporating the GLM, GBIC, 1x9 or small form factor transceiver do not need to recertify their product for laser safety. The procedure for full system certification is therefore identical to that used for any other electronic system. When applying for system level certification to electronic standards such as IEC950, the regulatory engineers may want to see the DHHS and European conformity labeling on the GLM, GBIC, 1x9 or small form factor transceiver, and the system level documentation and labeling. Copies of the certificate of conformity for any GLM, GBIC, 1x9 or small form factor transceiver sold by Emulex can be obtained upon request from Emulex Corporation, Costa Mesa.